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Indian Standard

SPECIFICATION FOR ELECTROPLATED COATINGS OF BRASS

(First Revision)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

SPECIFICATION FOR ELECTROPLATED COATINGS OF BRASS

(First Revision)

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Indian Standard

SPECIFICATION FOR ELECTROPLATED COATINGS OF BRASS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 30 July 1982, after the draft finalized by the Metallic Finishes Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This Indian Standard is intended for articles electrodeposited with brass, an alloy deposition of copper and zinc, which is used extensively for decorative purposes. Brass plating is also applied to steel, being effective for strong bonding of rubber to metal. Electroplated brass over aluminium and zinc diecastings, steel tubing and stamping, because of its decorative effect, has been widely used as a substitute for solid brass where weight and cost are factors. Copper conductors have been brass plated as a protection against specific types of corrosion.

0.3 Brass plating as such offers inadequate resistance to corrosion. Due to different conditions of exposure it may not be possible to predict the average life of brass deposit specified in this specification. However, an attempt has been made to obtain satisfactory requirements of brass coating, to form a workable basis between consumers and platers.

0.4 This standard was first published in 1961. It is being revised in the light of the experience gained since its first publication. In this revision EDTA methods for the determination of zinc have been included.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers the requirements for electrodeposition of brass on iron and steel surfaces. It, however, does not cover electro-deposition of 'white brass'.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Surface — Surfaces on which electroplater has to work.

2.2 Significant Surface — The surface agreed upon between the purchaser and the electroplater, and indicated on the drawing or suitably marked on a sample with particular reference to the surfaces not to be plated.

NOTE — Surfaces on which a controlled deposit cannot ordinarily be obtained; such as holes, recesses; bases of angles and similar areas, are normally exempted from the requirements for significant surfaces, unless they are specifically designated as such.

3. CLASSIFICATION

3.1 This specification covers two classes of coating, namely:

Class A — For decorative-cum-protective purposes on iron and steel surfaces, and

Class B — For rubber bonding.

4. MATERIALS AND WORKMANSHIP

4.1 Materials — The materials used shall be such as to produce brass coating conforming to this specification.

4.1.1 The basis metal used for Class A coating shall be substantially free from flaws or defects detrimental to the appearance or the protective value of the plating.

4.2 Workmanship — All details of workmanship shall conform to the best practice of high quality plating.

5. PREPLATING TREATMENT

5.1 It is necessary to clean the surface chemically to secure good adhesion of deposits. Iron and steel surfaces generally necessitate preplating treatments of pickling and other cleaning process to ensure good, clean surface to receive plating and to yield a deposit as specified in this standard.

6. PLATING

6.1 Quality of Plating — The plating shall appear as a smooth continuous envelope over the basis metal and shall be free from blisters, pores, and other visible defects, that affect appearance or adhesion to rubber as the case may be.

6.2 Colour of Coating — The colour of the brass coating shall be subject to agreement between the plater and the purchaser.

6.3 Thickness of Plating — The thickness of plating for Class A application shall be not less than 8 µm and for Class B application it shall be of the order of 2·5 µm.

6.4 Composition — The composition (copper-zinc ratio) of the deposit shall be the subject of agreement between the plater and the purchaser. In the case of Class B coating a composition of 70 percent copper and 30 percent zinc (with ± 2 percent tolerance) is recommended.

7. LACQUERING

7.1 A final layer of lacquer shall be given on brass plating as a protective finish.

7.2 Lacquer conforming to IS : 349-1956* or any other suitable lacquer which meets the requirements of **7.2.1** and **7.3.1**.

7.2.1 The lacquer shall be abrasion-resistant and shall have no reaction on the brass plating. It shall not change colour with age.

7.3 Lacquering Process — Lacquering shall be achieved either by dipping or by spraying, the consistency of lacquer being adjusted to suit the requirements.

7.3.1 The lacquer, which shall be clear and transparent, shall dry quick and hard, without leaving pores or breaks on the plated surface. After lacquering, the surface of the articles shall be scratched by a finger nail. The scratched area shall not show any white mark.

8. DETERMINATION OF THICKNESS OF DEPOSIT

8.1 Spot-Test (Routine) — Approximate thickness for control purposes may be measured by a spot test solution consisting of one percent of sulphuric acid and one percent of potassium-ferrocyanide (LR grade). Place a drop of the solution on the brass plate with a glass rod. The number of seconds required for the test spot to turn blue is a rough measurement of thickness of plating. Brass plate of thickness of the order of 0·5μm will turn blue in about 10 seconds at room temperature ranging from 25 to 35°C.

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*Specification for lacquer, cellulose, clear.

8.2 Micrometer Method (Routine) (for Thicknesses of the Order of Class A Coating) — The thickness of the article shall be measured with a micrometer before and after brass plating. From the difference between the two measurements, the thickness of coating shall be determined.

8.3 Chemical Method (Routine) — Clean a plated part or test piece of known area, weigh and totally immerse in a solution containing 75 g of ammonium pursulphate, 335 ml of ammonium hydroxide (rd = 0·88) and 665 ml of water until the coating is completely dissolved. Remove the piece from the solution and wash thoroughly. Dry and weigh.

$$\text{Thickness of plating in micrometers} = \frac{10\,000\,M}{A \times D}$$

where

M = mass of coating in g,
A = area of the surface in cm^2, and
D = density of brass composition in g/cm^3.

NOTE — For the purpose of this test the density of brass coating may be taken as that of 70-30 brass and the graph in Fig. 1 is given as a reference to indicate the variation in the density with the composition of the brass.

9. ADHESION TEST

9.1 Bend Test — Place the sample in a bend tester with 4 mm radius of bending or in a vice as shown in Fig. 2. Bend the sample as far as 90° forward and backward, successive bends being made in opposite directions. For the purpose of this test, one bend shall constitute bending forward to 90° and back to original position. Repeat this process and count the number of bends until flaking occurs. The sample shall stand three such bends without flaking.

10. COPPER-ZINC RATIO

10.1 Determination of Copper — A plated part or test piece of known area shall be cleaned, weighed and totally immersed in a solution containing 75 g of ammonium persulphate, 335 ml of ammonium hydroxide (rd = 0·88) and 665 ml of water until the coating is completely dissolved. Remove the piece from the solution and wash down the piece with a dilute solution of ammonia into the stripping solution. Weigh the piece. Heat and reduce the bulk of the solution to half its original volume and wash the precipitate with hot dilute ammoniacal water.

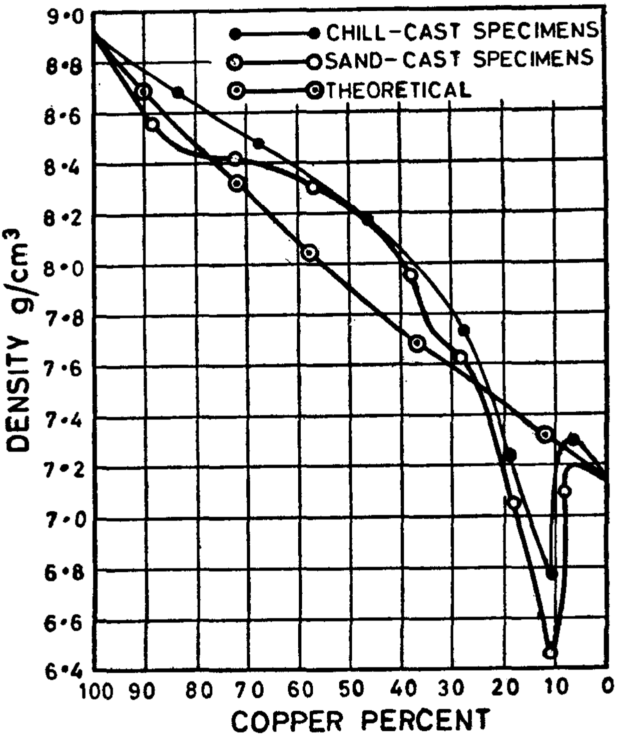

FIG. 1 VARIATION OF DENSITY OF BRASS

Neutralize the filtrate with dilute sulphuric acid (1:1) and add 10 ml in excess. Dilute to a sufficient volume with water to cover the gauze of the platinum cathode. Start the stirrer and electrolyse at a current of one ampere until the cathode is completely covered with a deposit of copper; then increase the current to 1·5 A. At the end of 30 minutes, raise the solution level to see if any more copper passes out to the platinum cathode stem. If not, stop the stirring and with the current on, wash the deposit, while lowering the beaker, receiving the wash water in the beaker. Preserve this solution for the determination of zinc under

10.2 Wash the deposit with water, then with alcohol, dry in an oven at 105°C for about two minutes, cool and weigh. Strip the deposit from the cathode in hot 25 percent nitric acid, wash and dry it as before, then cool and weigh.

10.1.1 *Calculation*

$$\text{Copper in the coating, percent by mass} = \frac{M}{M_1} \times 100$$

where

M = mass in g of copper deposited on the cothode, and

M_1 = mass in g of the coating (difference in masses of the test piece before and after stripping).

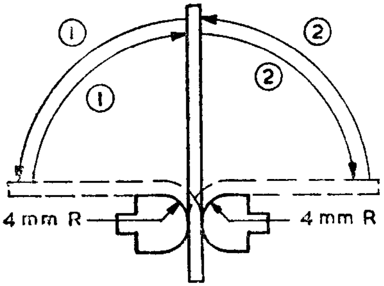

FIG. 2 BEND TESTER

10.2 Determination of Zinc

10.2.1 *Potassium Ferrocyanide* (*Volumetric*) *Method* — To the solution after electrolysis of copper, add three to four drops of diphenyl benzidine indicator [one gram dissolved in 100 ml of concentrated sulphuric acid (conforming to IS : 266-1977*)]. Titrate with 0·05 N standard potassium ferrocyanide solution. The colour changes from purple to pale green at the end point.

10.2.1.1 *Calculation*

$$\text{Zinc, percent by mass} = \frac{AF}{M}$$

where

A = volume in ml of potassium ferrocyanide solution,

F = 0·490 4 (ml of 0·05 N potassium ferrocyanide = 0 004 904 g of zinc), and

M = mass in g of the coating.

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*Specification for sulphuric acid (*second revision*).

10.2.2 *EDTA Method*

10.2.2.1 Zinc may either be determined in accordance with IS : 3685-1966* or by the method for which outline has been given in **10.2.2.2**.

10.2.2.2 *Outline of the method* — To a weakly acidic solution of the brass coating, add a few millilitres of ammonium chloride/ammonium hydroxide buffer solution. Then add potassium cyanide (AR) in small proportions to allow the cations to form complexes with the cyanide.

Proper amount of cyanide is readily determined by the colour of the solution. With copper ions present in the solution, it gets decolorized. If, however, cobalt and nickel are present, the colour changes to yellow. With further addition of potassium cyanide the colour does not change. If mercury is present, initially a precipitate is formed which gets dissolved with excess cyanide. Excess amount of cyanide does not interfere.

After adding cyanide, add erichrome black T to form a blue solution. In presence of cobalt and nickel, however, the colour of the solution shall become green.

Now add a few millilitres of 10 percent formaldehyde or chloral hydrate solution and titrate immediately with EDTA to a colour change from wine red to blue.

NOTE — This is relatively a quicker method for the determination of zinc in electrodeposited coatings of brass. The method is effective even in presence of metallic ions like cobalt and nickel besides copper.

11. SAMPLING AND INSPECTION

11.1 Sampling for Production Control — Statistical quality control is recommended for controlling the quality of brass-plated articles. For this purpose, it is recommended that samples should be taken from a place in the plating bath which is likely to give the minimum thickness of plating. The appropriate tests specified in **8** and **9** shall be conducted on such samples.

11.2 Sampling for Acceptance of a Lot — For the purpose of this sampling, a lot shall be divided into sub-lots consisting of 100 articles or part thereof, of any such articles, as are electroplated at one time in the same bath. Two samples shall be selected from each sub-lot and subjected to the tests specified in **8**, **9** and **10**.

11.2.1 *Criteria of Acceptance* — If these samples pass the tests, the sub-lot represented by them shall be accepted. If one or both the samples should fail, two further samples shall be selected from the same sub-lot and subjected to the tests. If both these samples pass the tests, the sub-lot shall be considered as conforming to the standard. If either of them fails in any of the tests, the sub-lot shall be rejected.

---

*Methods of chemical analysis of brasses.

12. MARKING

12.1 Articles shall be marked with the thickness of the plating and the name or trade-mark of the manufacturer.

12.1.1 Articles may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	$1\ N = 1\ kg.m/s^2$
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	$1\ T = 1\ Wb/m^2$
Frequency	hertz	Hz	$1\ Hz = 1\ c/s\ (s^{-1})$
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	$1\ Pa = 1\ N/m^2$

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AMENDMENT NO. 1 NOVEMBER 1985

TO

IS:1773-1982 SPECIFICATION FOR ELECTROPLATED COATINGS OF BRASS

(First Revision)

(*Page 5, clause 6.1*) – Add the following new clause after 6.1:

'6.1.1 To improve the quality of decorative brass plating on ferrous metals, it is now usual to apply an initial deposit of bright nickel or bright copper from a levelling type solution and then to brass plate, so that bright brass finish is obtained, without the need for the addition of brightner additives to the brass plating solution. Corrosion protection is provided by means of the initial nickel/copper deposit.'

(SMDC 23)

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